



## Effective use of administrative data for evaluation research: The Parachute Ankle Brace study

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# Co-Authors

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# Main topics in this talk

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1. Define terms
2. Describe the Total Army Injury and Health Outcomes Database (TAIHOD)

Contents, data sources  
Research priorities

3. Illustrate use of TAIHOD for evaluation research (PAB study)
4. Describe how to access TAIHOD



# 1. Define terms

“Effective use of administrative data for evaluation research”

*Administrative data are*

- Routinely collected, not primarily for research
- This has implications (positive and negative) for:
  - data quality
  - completeness
  - comprehensiveness
- Useful for research when properly compiled and handled
- Sometimes the only option

“Routinely collected” → reduced bias?



# 1. Define terms, continued

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*Evaluation research* aims to measure the success of programs, policies, or interventions

Some types of research, and the questions they address:

| Descriptive                      | Etiological  | Evaluative   |
|----------------------------------|--------------|--|
| Who?<br>What?<br>When?<br>Where? | Why?<br>How? | How well?<br>How cost-effective?<br>Under what<br>circumstances? |



## 2. Describe the Total Army Injury and Health Outcomes Database (TAIHOD)

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- Developed under the Defense Women's Health Research Project, 1994, now a continually updated data warehouse (repository)
- Regular updates, managed & maintained by the US Army Research Center for Environmental Medicine (USARIEM), Natick, Massachusetts
- Program Director: CPT Owen T. Hill, Ph.D
- Acting Program Director: Robert F. Wallace, Sc.D.
- Co-investigators:

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## 2. Describe TAIHOD, continued

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- Projects focus on intentional and unintentional injury risks
- Funding sources include DoD, Department of the Army, NIH
- Administrative data collected by DoD, used for payroll, other financial purposes
- Individual soldier data are linked

Demographic, occupational characteristics

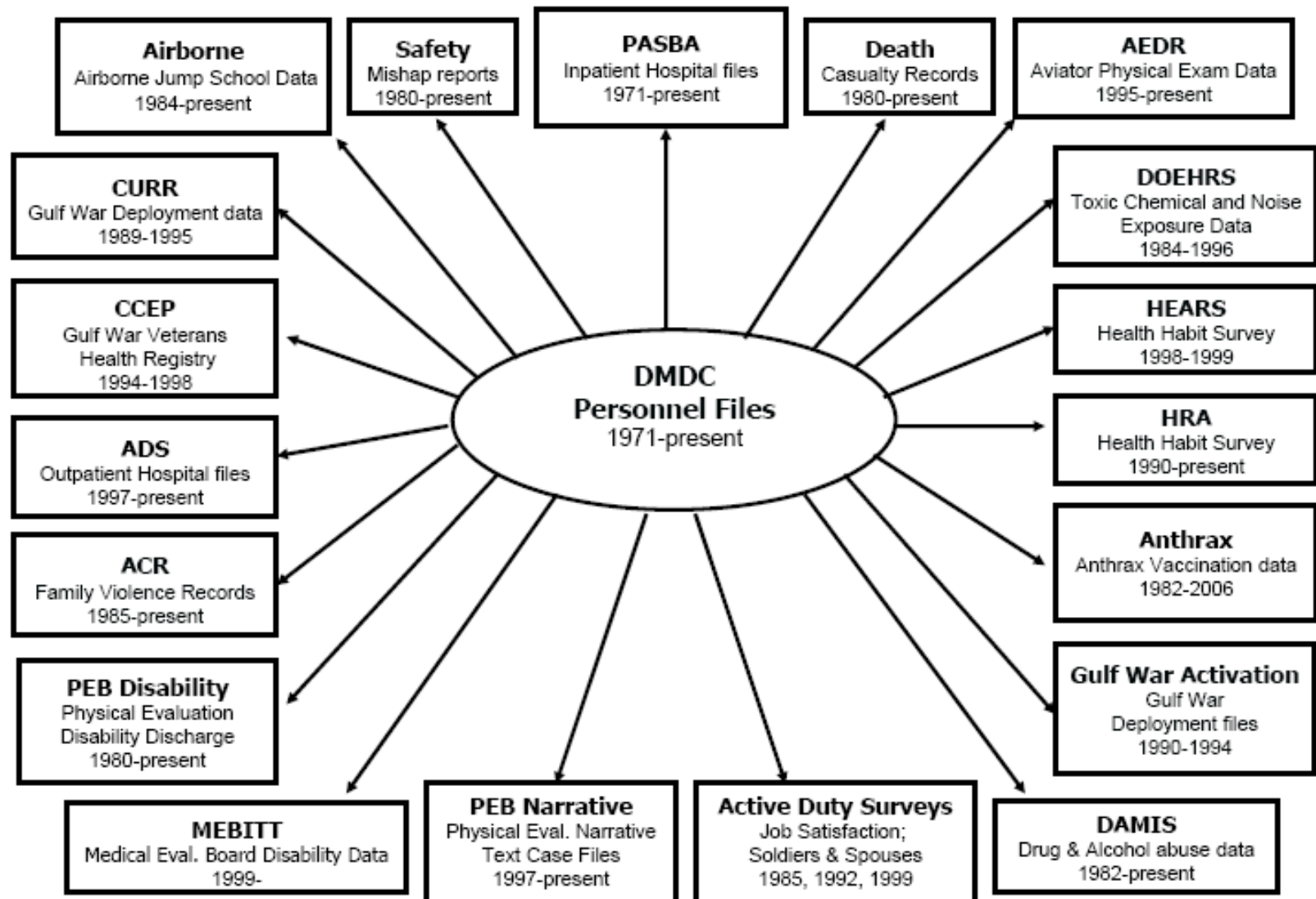
Health outcomes

Behaviors

- Data collected throughout an Army soldier's career



# Current TAIHOD Components



## 2. Describe TAIHOD, continued

Agencies providing data to TAIHOD include:

- DMDC: Defense Manpower Data Center
- PASBA: Patient Administration and Biostatistical Activity
- U.S. Army Safety Center
- USAPDA: U.S. Army Physical Disability Agency



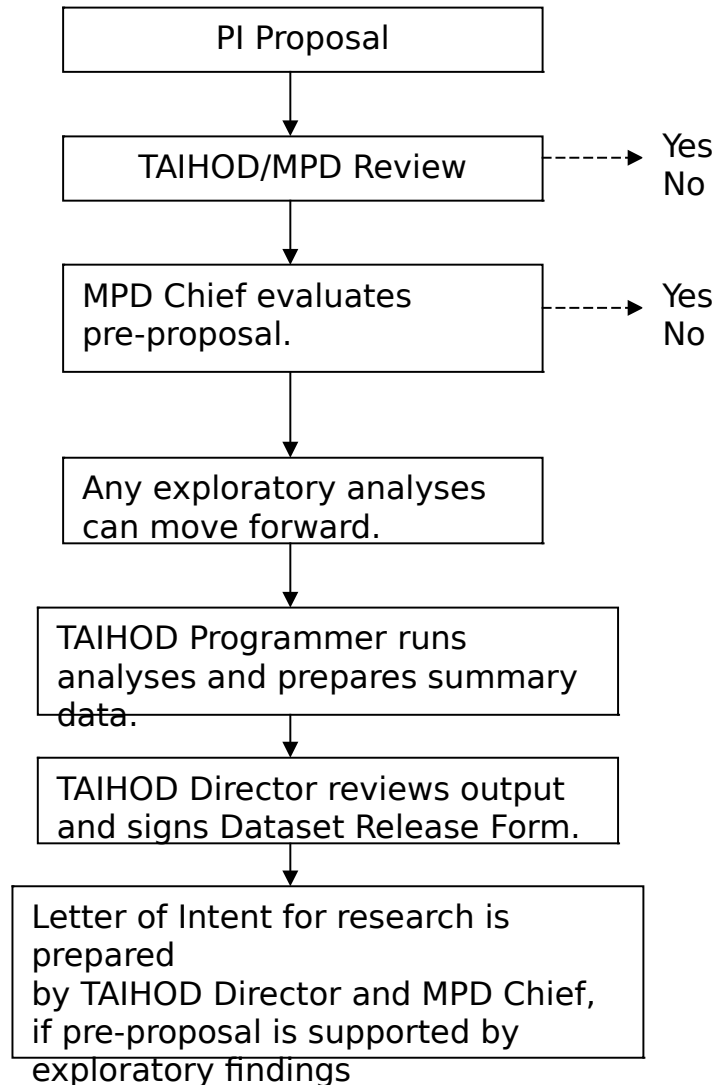
## 2. Describe TAIHOD, continued

### TAIHOD priorities:

- Mission-related
- Appropriate data
- Adequate resources
- USARIEM PI
- Review & approval:

IRB, SRC, HURC,  
HSRBB, USARIEM  
Commander

### Research Requests



### 3. Illustrate TAIHOD: PAB evaluation study

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#### Aim

To assess the effectiveness of an outside the boot parachute ankle brace (PAB) in preventing ankle injury during Airborne training

#### Data sources

DMDC: Demographic and occupational data, including dates of activation and release from duty

Airborne Jump School training rosters

Inpatient hospital data

*(Outpatient data will be added for a follow-on study)*



### 3. Illustrate TAIHOD, continued

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#### PAB study: Background and rationale\*



**FIG 1.** The outside-the-boot parachute ankle brace. (Photograph courtesy of Air-cast Corp.)

- Estimated injury rates among paratroopers as high as 110 per 1,000 jumps
- 30% to 60% of paratrooper injuries are to the ankle
- RCT of ankle braces during training: inversion ankle sprains 7 times higher in non-braced vs. braced jumps (1.3% vs. 0.9%; OR=6.9,  $p=0.04$ )
- Brace use adopted in 1994, discontinued in 2000

\*Amoroso et al. The Jnl of Trauma: Injury, Infection and Crit Care 1998; 45:575-580



### 3. Illustrate TAIHOD, continued

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TAIHOD priorities: application to PAB

|                                 |            |
|---------------------------------|------------|
| Is project mission-related?     | <b>YES</b> |
| Are appropriate data available? | <b>YES</b> |
| Adequate resources?             | <b>YES</b> |
| USARIEM PI?                     | <b>NO</b>  |

Required reviews & approvals

|                   |            |
|-------------------|------------|
| IRB               | <b>YES</b> |
| SRC               | <b>YES</b> |
| HURC              | <b>YES</b> |
| HSRBB             | <b>No*</b> |
| USARIEM Commander | <b>YES</b> |

\* Requirements have since changed



### 3. Illustrate TAIHOD, continued

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#### Design of PAB evaluation: Repeated panel study

- Identify calendar time periods when the braces were and were not in use between 1985 and 2002
- Classify students as receiving training (jump week) during brace use or non-use periods
- Identify severe, parachuting-related injuries from (inpatient) hospital data
- Compare hospitalization rates for categories of injury across brace use and non-use periods



### 3. Illustrate TAIHOD, continued

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#### Study population

- Student rosters for 1 January 1985 to 31 December 2001 linked to DMDC files within one year of training date
  - Roster data: training dates, graduation status, reason for not graduating
  - DMDC: confirm active duty/Regular Army, provide occupational and demographic data
- Exclusions
  - Students trained during the Amoroso et al. RCT (N=1335) or the following two months (N=1852)
  - Missing (N=114) or unreliable covariate data (N=1076)
- Final study population: N=227,549, including 37,977 non-graduates



### 3. Illustrate TAIHOD, continued

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#### Injuries assessed in relation to PAB use:

- Parachuting-related injuries:  
Admission occurred during the 5 weeks starting with scheduled “jump week” (training week 3) *and*  
Cause-code = parachuting
- Hospital diagnoses grouped according Barrell matrix, revised to include:  
Ankle  
Non-ankle musculoskeletal  
Traumatic, non-ankle  
Multiple traumatic injuries
- Ankle injuries with related orthopedic procedure codes = “severe”



### 3. Illustrate TAIHOD, continued

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## Summary of PAB evaluation results

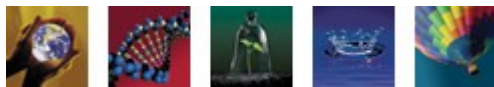
- 2,230 hospitalizations  
628 (28.2%) included an ankle injury diagnosis,  
525 (23.5%) with orthopedic procedures.
- Adjusted odds of severe ankle injury nearly twice as high when braces not used compared to brace use periods
- Odds of non-ankle musculoskeletal injury and multiple injuries did not differ between brace use and non-use periods.



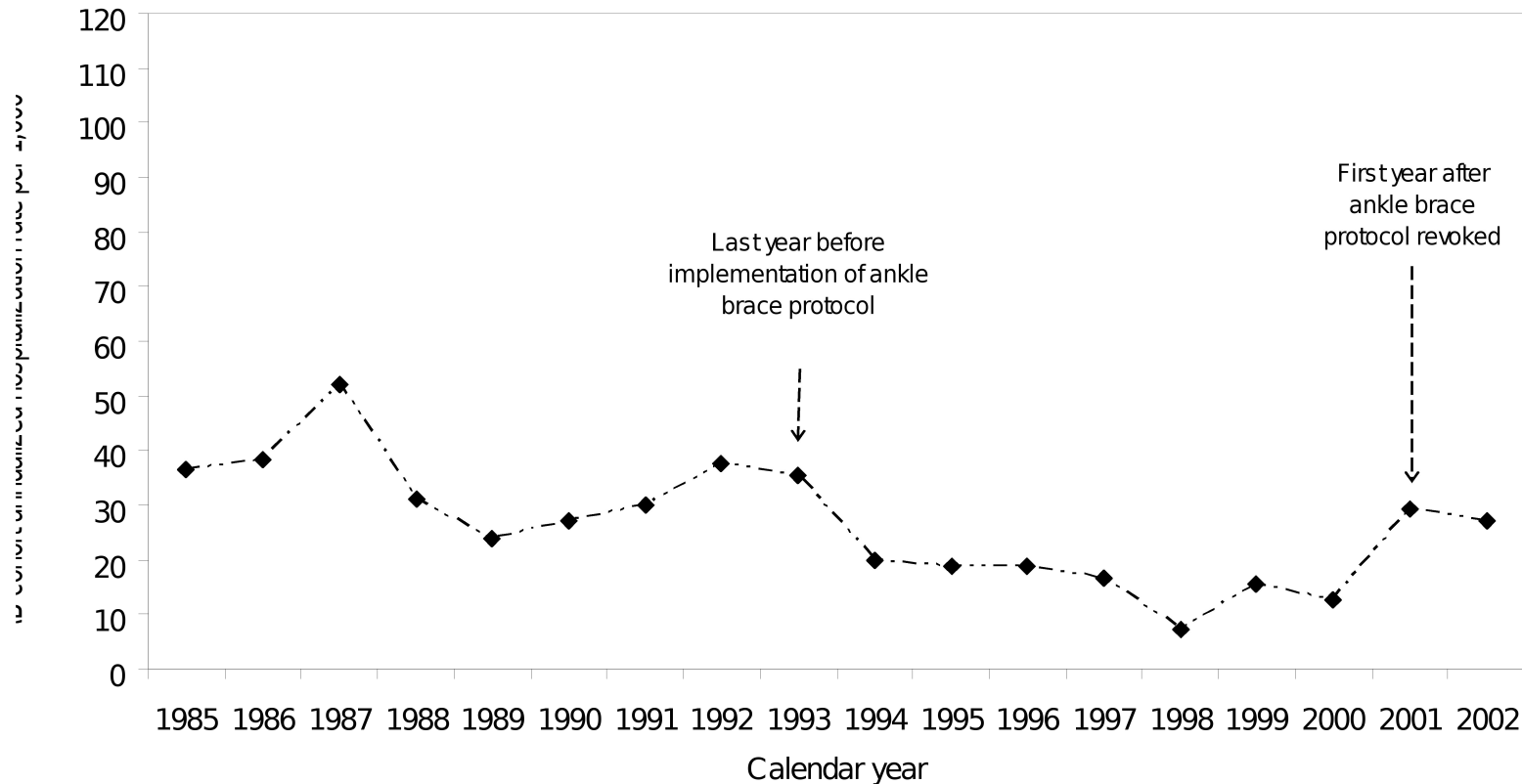
## Adjusted odds of parachuting-related injuries

| Type of injury:             | Ankle            |            | Non-ankle musculoskeletal |            | Multiple         |             |
|-----------------------------|------------------|------------|---------------------------|------------|------------------|-------------|
|                             | OR <sup>a</sup>  | 95% CI     | OR <sup>a</sup>           | 95% CI     | OR <sup>a</sup>  | 95% CI      |
| <b>Protocol<sup>b</sup></b> |                  |            |                           |            |                  |             |
| Pre-brace                   | 2.38             | 1.92, 2.95 | 1.78                      | 1.27, 2.50 | 2.40             | 1.27, 4.53  |
| Brace                       | 1.0 <sup>c</sup> | --         | 1.0 <sup>c</sup>          | --         | 1.0 <sup>c</sup> | --          |
| Post-brace                  | 1.72             | 1.27, 2.32 | 0.92                      | 0.53, 1.60 | 1.81             | 0.76, 4.30  |
| <b>Age at training</b>      |                  |            |                           |            |                  |             |
| 17-18                       | 1.0 <sup>c</sup> | --         | 1.0 <sup>c</sup>          | --         | 1.0 <sup>c</sup> | --          |
| 19-20                       | 1.20             | 0.9, 1.060 | 1.11                      | 0.71, 1.74 | 1.26             | 0.54, 2.95  |
| 21-22                       | 1.79             | 1.33, 2.42 | 1.22                      | 0.74, 2.02 | 1.46             | 0.57, 3.70  |
| 23-24                       | 1.84             | 1.33, 2.54 | 1.22                      | 0.70, 2.11 | 1.70             | 0.64, 4.53  |
| 25-29                       | 2.71             | 2.03, 3.63 | 1.63                      | 0.99, 2.68 | 2.77             | 1.17, 6.56  |
| 30-34                       | 3.18             | 2.22, 4.56 | 2.97                      | 1.68, 5.26 | 5.39             | 2.11, 13.77 |
| 35-56                       | 4.89             | 3.04, 7.85 | 4.07                      | 1.86, 8.91 | 3.67             | 0.78, 17.36 |
| <b>Race/ethnicity</b>       |                  |            |                           |            |                  |             |
| White                       | 1.0 <sup>c</sup> | --         | 1.0 <sup>c</sup>          | --         | 1.0 <sup>c</sup> | --          |
| Black                       | 1.23             | 1.00, 1.51 | 0.67                      | 0.42, 1.05 | 1.04             | 0.53, 2.02  |
| Other                       | 1.25             | 0.97, 1.60 | 1.54                      | 1.05, 2.27 | 1.95             | 1.04, 3.63  |

a: Odds ratio and 95% confidence interval, adjusted for age, gender and race/ethnicity; b: Protocol period based on jump week date: Pre-brace (1/1/95-9/30/93); Brace (1/1/94-9/30/00); Post-Brace (10/1/00-12/31/02); c: Referent category



# Annualized ankle injury hospitalization rates for PAB cohort, 1985-2002



\*Schmidt et al., Injury Prevention 2005;11:163-168.



### 3. Illustrate TAIHOD, continued

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#### Economics of the PAB

##### Assumptions for expenditures:

- Cost per brace: \$60.00
- Average lifespan of brace: 1 year
- Average annual purchase and replacement needs: 500 units/year, or \$30,000 per year

##### Assumptions for costs avoidance:

- Brace use adopted at the Airborne School
- Brace use results in 50% reduction in rate of severe ankle injury
- Injury rates remain stable
- Expected cost avoidance is \$865,000

***Ratio of estimated expenditures : costs avoided  
(hospitalization and rehabilitation) is 1 : 29***



### 3. Illustrate the TAIHOD, continued

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*Evaluation research* aims to measure the success of programs, policies, or interventions

Some types of research, and the questions they address:

| Descriptive                      | Etiological  | Evaluative   |
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| Who?<br>What?<br>When?<br>Where? | Why?<br>How? | How well?<br>How cost-effective?<br>Under what<br>circumstances? |



### 3. Illustrate the TAIHOD, continued

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How well did the PAB perform?

- PAB use was associated with a 2 fold reduction in risk of severe ankle injuries
- PAB use was not associated with risk of other or multiple injuries

How cost-effective is the PAB?

- Costs expected: costs avoided about 1:29
- Only considers costs of hospital care and rehabilitation

Under what circumstances did it perform ?

- Universal adoption
- Proper use
- Complete and accurate data assumed



## 4. How to access TAIHOD

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A. *Contact the Program Director **before** pursuing funding or preparing a full research protocol.*

Informal discussions will determine if:

- The proposed research is in line with the TAIHOD and Army research mission
- The TAIHOD contains the necessary data
- Staffing resources can be made available to support the effort



## 4. How to access TAIHOD, continued

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### *B. Submit a research prospectus to the Program Director*

Prospectus to include (partial list)\*:

- Research summary, including objectives and hypotheses
- Projected timing and amount of funding; funding sources
- Qualifications of primary investigator and all collaborators
- Preliminary analyses requested (feasibility assessments)

\*Contact Program Director for full requirements.



## 4. How to access TAIHOD, continued

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*C. Before requesting TAIHOD data, remember to consider:*

- Time needed for internal (USARIEM) reviews
- Scientific review, ethics review, USARIEM Commander
- Need for external IRB review (non-USARIEM investigators)
- USARIEM resources required to execute your project or develop your data set
- Limitations of administrative data
- TAIHOD program priorities



## Contact information

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*Disclaimer:* The opinions or assertions contained herein are the private views of the author(s) and are not to be construed as official or as reflecting the views of the Army or the Department of Defense.

*Thank you for your attention*



# Ankle injury codes

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Ankle injury: Primary or secondary diagnosis of ankle fracture (824), ankle sprain (845.0), or ankle dislocation (837)

Severe ankle injury: As above, plus one of the following ankle procedure codes: 790.6, 790.7, 791.6, 791.7, 792.6, 792.7, 793.6, 793.7, 797.7, 798.7, 793.9, 801.7, 802.7, 808.7, 814.9



# Non-ankle musculoskeletal injury codes

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Primary or secondary diagnosis of :

- 1) Fracture of vertebral column (805.4-805.9, 806.4-806.9), pelvis (808), neck of femur (820), other/unspecified part of femur (821), patella (822), tibia and fibula (823), tarsal/ metatarsal bones (825), phalanges of foot (826), other, multiple, ill-defined of lower limb (827); involving multiple limbs (828); *or*
- 2) Dislocation of hip (835), knee (836), foot (838); and other, multiple, ill-defined dislocations of lumbar (839.20, 839.30), coccyx (839.41, 839.51), sacrum (839.42, 839.52), pelvis (839.69, 839.79); *or*
- 3) Sprains and strains of hip and thigh (843), knee and leg (844), foot (845.1), sacroiliac region (846), other and unspecified part of back (847.2-847.4) or pelvis (848.5).



# Any traumatic injury

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## Primary or secondary diagnosis:

Fracture (800-823, 825-829)

Dislocation (830-836, 838, 839)

Sprains and strains (840-844,  
845.1, 846-848)

Internal injury (850-854, 860-  
869, 952, 995.55)

Open wound (870-884, 890-894)

Amputation (885-887, 895, 897)

Blood vessel injury (900-904)

Contusion/superficial injury (910-  
924)

Crush injury (925-929)

Burn injury (840-849)

Nerve injury (950-951, 953-957)

Unspecified injury (959)



# Multiple traumatic injuries

Two or more injuries to the following:

brain;  
other head, neck and face;  
spinal cord;  
vertebral column;  
chest (thorax);  
abdomen;  
pelvis and urogenital;  
trunk;  
back and buttock;  
shoulder and upper arm;  
forearm and elbow;

wrist, hand, and fingers;  
other/unspecified upper extremity;  
hip;  
upper leg and thigh;  
knee;  
lower leg and ankle;  
foot and toes;  
other/unspecified lower extremity.

